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PRELIMINARY OPERATING INSTRUCTIONS
FOR
MODEL 130 SERVO CHART DRIVE

-2



Bruel & Kjaer
Precision
Instruments

B & K INSTRUMENTS, INC.

5111 WEST 164TH ST • CLEVELAND, OHIO 44142

Diefl Transistor Servo Amplifier (Singer Co.) *TH 010-PA-505*
s/N #97473 cat. *TH 010-PA-505*
S.S. *9-782415-01*
10 w Output *modulator -*

s/N #87668 cat. *P840-02-130*
model 130 part *9-811596-01*
60 Hz freq.

P840-02 Drive

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EX # 38440-2

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MODEL 130 SERVO CHART DRIVE
PRELIMINARY INSTRUCTION MANUAL

The Model 130 Servo Chart Drive is a quick connect device which is used to convert the B & K Model 2305 Recorder to remote control chart positioning. The unit, once attached, will position a polar chart to coincide with the shaft position of a remote synchro transmitter.

The Servo Drive Unit Model 130 operates from 115 volt, 400 cps power. The remote synchro transmitter is attached through an Amphenol Type 165-15 7-pin connector on the side of the servo. A 360 vernier readout dial is viewed through the unit's cover to determine the output shaft position. An "off-on" switch is provided to disconnect the power to the servo.

When a chart type QP 5102 is first attached to the recorder, it can be jogged into coincidence with the output dial and the synchro transmitter angle. This jogging is achieved by off-setting the knob marked "Paper Speed mm/sec" extending from the cover of the recorder. A small off-set in the knob permits the chart to run without appreciably changing the position of the readout dial. The knob is held up by the guide pin when the angle on the chart agrees with the readout dial.

THEORY OF OPERATION

The Model 130 Servo Chart Drive is a feedback control device. A block diagram of its operation is shown on Page 2//
The remote synchro transmitter is excited with 115 volts, 400

cps on its rotor. Its three stator leads are attached through the Amphenol connector with the three stator leads on the synchro transformer in the servo unit.

The shaft on the synchro transformer is geared to coincide with the chart position. This gearing (6.4/1) is necessary because the input to the recorder is through the sprocket drive which is on the edge of the paper. In other words the sprocket rotates 6.4 times for each rotation of the polar chart. The readout dial is placed on the same shaft as the synchro transformer.

A clutch is used between the synchro transformer and the motor. The motor, however, is geared directly to the sprocket. A knob is connected to the transformer shaft so that a small offset can be placed on this shaft. This will drive the motor and sprocket while the clutch is slipping.

An error voltage is developed across the rotor of the synchro transformer. This voltage is directly proportional to the angular difference between the shaft of the synchro transmitter and transformer. The error voltage is fed to the servo amplifier which drives the servo motor so as to reduce the error. The tachometer voltage is also fed to the servo amplifier to anticipate changes in the motor's motion so as to stabilize this correcting action.

ATTACHING THE MODEL 130 SERVO TO THE B & K 2305 RECORDER

A. PREPARING 2305 FOR ATTACHING THE MODEL 130

1. Remove the side cover plate from the recorder.

2. Attach the coupling shaft to the recorder. This is mounted to the recorder through the hole that is common to the thumb wheel*. Rotate the thumb wheel until the set screw is up. Insert a 1/16" Allen wrench into the small opening in the table top and back out the screw. Insert the coupler with the flat side up. Position the coupler to prevent its rubbing the recorder. Tighten the Allen screw.

Due to slight variations in manufacturing, the level recorder, it may be necessary to adjust the Model 130 shaft length so the servo fits tightly against the level recorder.

Remove the cover from the Model 130 Servo Drive ... this is the cover with the window. Note: The slotted coupler and insert Allen key to adjust coupler to proper length.

B. ATTACHING THE MODEL 130 SERVO

1. De-couple the recorder drive by lifting the gear changer marked "Paper Speed mm/sec" so that it rests on its pin.
2. Align the coupling shaft by rotating the 2305 thumb wheel until the coupling shaft and the mating on the Model 130 coincide.
3. Insert the coupler and mating shaft by bringing the Servo up to the recorder.

** The Paper Drive Mechanical Output*

4. Place both hold down clamps in the center of the plate and push the Servo tight against the recorder.
5. Fasten the mounting thumb screw.
6. Move the clamps into position so that they grip the edges of the recorder side opening and fasten. Some re-adjustment may be necessary to permit the drive to move freely.
7. Attach the Amphenol Cable connector type 165-14. See ^{Page 11} Figure 4 for wiring information.
8. Turn power "ON" to operate.

ACCESSORIES AVAILABLE FOR MODEL 130

QP 5102 Paper, Polar Chart, Ink Writing\$12.00
(100 sheets per package)

QI 0001 Inking Kit.....\$38.20

Consisting of:

- 3 - Inking Pens
- 1 - Pen, event marker inking
- 10 - Cartridges, Black Ink
- 10 - Cartridges, Red Ink
- 10 - Cartridges, Green Ink

QI 0100 Cartridges, Black Ink (100).....\$19.80

QI 0200 Cartridges, Red Ink (100).....\$15.50

QI 0300 Cartridges, Green Ink (100).....\$15.50

DB 0340 Pen, Polar Chart Pivot.....\$1.25

DH 2001 Pen, Chart Ink.\$5.35

DH 2000 Pen, Event Ink\$8.00

DH 0039 Insert, Ink Pen.....\$.40

AN 0006 Cable, Power.....\$1.45

VF 0010 Fuse, 2 A.....\$.20

VS 8024 Lamp, Panel.....\$.55

PARTS LIST - TA 010 - PA - 500 SERIES - STD. TA 010-0A-120

HIGH GAIN PREAMPLIFIER MODULATOR-POWER SUPPLY

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
* 1.	Texas Instrument Diode TL61 (T151 on schematic)	9
c 2.	National Semi-conductor No. NS-422	5
3.	Transistors, RCA No. 2N-1700	2
4.	Zener Diodes. Motorola 1/4M6.8Z10	3
5.	Capacitors, Kemet K6R8J35S 6.8/35	5
6.	Capacitors, Kemet K3R3J35S 6.8/35	1
7.	Capacitors, Kemet K6R8J6S 6.8/6	2
8.	Capacitors, Kemet KLJ50S 1/50	2
9.	Capacitors, Kemet KR33J35S .33/35	1
10.	Resistors, Ohmite 10K 1/4W 10%	2
11.	Resistors, Ohmite 47K 1/4W 10%	1
12.	Resistors, Ohmite 4.7K 1/4W 10%	2
13.	Resistors, Ohmite 1K 1/4W 10%	3
14.	Resistors, Ohmite 820 1/4W 10%	1
15.	Resistors, Ohmite 220 ohm 1/4W 10%	2
16.	Resistors, Ohmite 470 ohm 1/4W 10%	2
17.	Resistors, Ohmite 270 ohm 1/4W 10%	1
18.	Resistors, Ohmite 3.3 ohm 1/4W 10%	1
19.	Resistors, Ohmite 18K 1/4W 10%	2
20.	Resistors, Ohmite 2 ohm 3W 10%	2
21.	Resistors, Ohmite 68K 1/4W 10%	1
22.	Resistors, Ohmite 1 Meg. 1/4W 10%	1
23.	Resistors, Ohmite 5.6K, 1/4W 10%	2
24.	Resistors, Ohmite 1.5K 1/4W 10%	

25.	Resistors, Ohmite 560 ohms 1/4W 10%	2
26.	Resistors, Ohmite 330 ohms 1/4W 10%	3
27.	Zener Diodes, Motorola 1/4M22Z10	1
28.	Transistor Mounting Pads. Milton	4
29.	Ross Metals Co. #10C38	
30.	14 Pin Headers #100GS-40W-RR-Pl4C	1
31.	(Made by Electrical Industries)	
32.	A #1029 Brass Eyelet	
33.	Stimpson Co., Inc.	
34.	Name Plates Diehl #1-992143-00	1
35.	Transistors, Texas Instruments	5
36.	No. TI-482	
37.	Keystone NTC Resistance Units	1
38.	Type RL11F1 Max. Rating 3/4W	
39.	535 ohms -10%	
40.	14 pin socket Cinch Jones number	1
41.	203-62-14-017	
42.	Screws, Stainless Steel 4-40 X 1 1/6" L	3
43.	Nuts. (for 4-40 X 1/8" L Screws).	3
44.	Spacers 5/16" L X 3/16" D	3
45.	Spacers 1/8" L X 3/16" D	3
46.	Transformer - Diehl #79	1
47.	Printed Circuit Wafers	3
48.	1st. Wafer	
49.	2nd. Wafer	
50.	3rd. Wafer	
51.	Resistor 3.3K 1/4W 10% Ohmite	1

52.	Resistor 470 K, 1/4W 10% Ohmite	1
53.	Resistor 56 K, 1/4W 10% Ohmite	1
54.	Resistor 68 ohm 1/2W 10% Ohmite	1
55.	Resistor 2.2 K 1/2W 10% Ohmite	1
56.	Resistor 1200 ohm, 1/2W 10% Ohmite	1
57.	Diode 1/4 M3.0Z10 Motorola	1
58.	Diode 1M12Z20 (20%) Motorola	1
59.	Resistor 10 K, 3W Ohmite	1
• 60.	Transistor 2N1701 RCA	1
61.	Sylvania Diode 1N2069	4
62.	Capacitor 50/50 V Sprague TE-1307	1
63.	Capacitor 500/50 V Cornell Dubilier	1
64.	BR 500-50	
65.	Capacitor .025/20 V #6539 Sprague TGS25	1
66.	Capacitor 820 MMF/300 V Elmeqco	1
67.	(Arco Electronics-Purchase) DM15-821	
68.	Mylar or equivalent insulator	1
69.	for use between base plate and First Wafer	
70.	220 ohm 1W Resistor	1
71.	Resistor 1 K 1/2 W	1

PARTS LIST - P840-02 DRIVE ASSEMBLY

<u>Item Description</u>	<u>Number</u>	<u>Quantity</u>
1. Gear	S25A-240	1
2. Gear	E25-32	1
3. Gear	E25-110	1
4. Gear	E22-25-P2	1
5. Gear	S22A-160	1
6. Hub	E52-4	2
7. Clutch	G150S-3	1
8. Dial Set	GJ-2	1
9. Bearings	GM-2S	4
10. Collar	G67-3	3
11. Shaft	G3-55	2
12. Shaft	G3-19	1
13. Knob	KN-13	1
14. Bearing	GM-3S	2
15. Bearing	GM-2S	1
16. Motor-Tach SERVOMOTOR 115V 36CT 1W OUTP. 2 POLES 60~ 2 PH.	FPE21L-109-2T ^{CAT. NO.} (FPE21L-109-2)	1
TACHOMETER 115V VOLT. OUTP./1000RPM (6.5) 20~ 1 PH.	18CT6b (18CT6-a) (MK. 25 MOD. 0)	1
17. Synchro Transformer S/N K7950 6 53 54		
18. Bearing	Z99R6Xr1-C	1
19. Terminal Boards		2
20. Switch DPDT		1
21. Label "OFF-ON"		1
22. Cover	HU-7640 5 15/16	1
23. Amplifier-Power Supply	TA010-PA500 (TA010-PA-505)	1
25. Connector Set Male & Female		1 set
26. Parts Fabricated as per Dwg.		

LIST OF PARTS

SERVOMOTOR

GEARHEAD

COUPLING (2) DIEHL PT. NO. 1-737866-00

BALL BEARINGS (2) STERLING PT. NO. GM-2S

SPUR GEAR (1) E22 - 25 - P2 (STAINLESS STEEL #303)

SPUR GEAR (1) E22-160-P2 (STAINLESS STEEL #303)

BENDIX CONNECTOR (1)

DIAL (1) STERLING PT. NO. GB-18

COLLAR (1) STERLING PT. NO. G57-S

SYNCHRO (1) SY-18-1

SHAFT (1) CD-1

SHAFT (1) CD-2

SHAFT (1) CD-3

COVER (1) CD-4

COVER (1) CD-5

SPACER (1) CD-6

BACK PLATE (1) CD-7

FRONT PLATE (1) CD-8

SPACER (1) CD-9-A

SPACER (1) CD-9-B

SCREW (2) 8-32UNC (Reduce Thread Dia. 008-.010.)

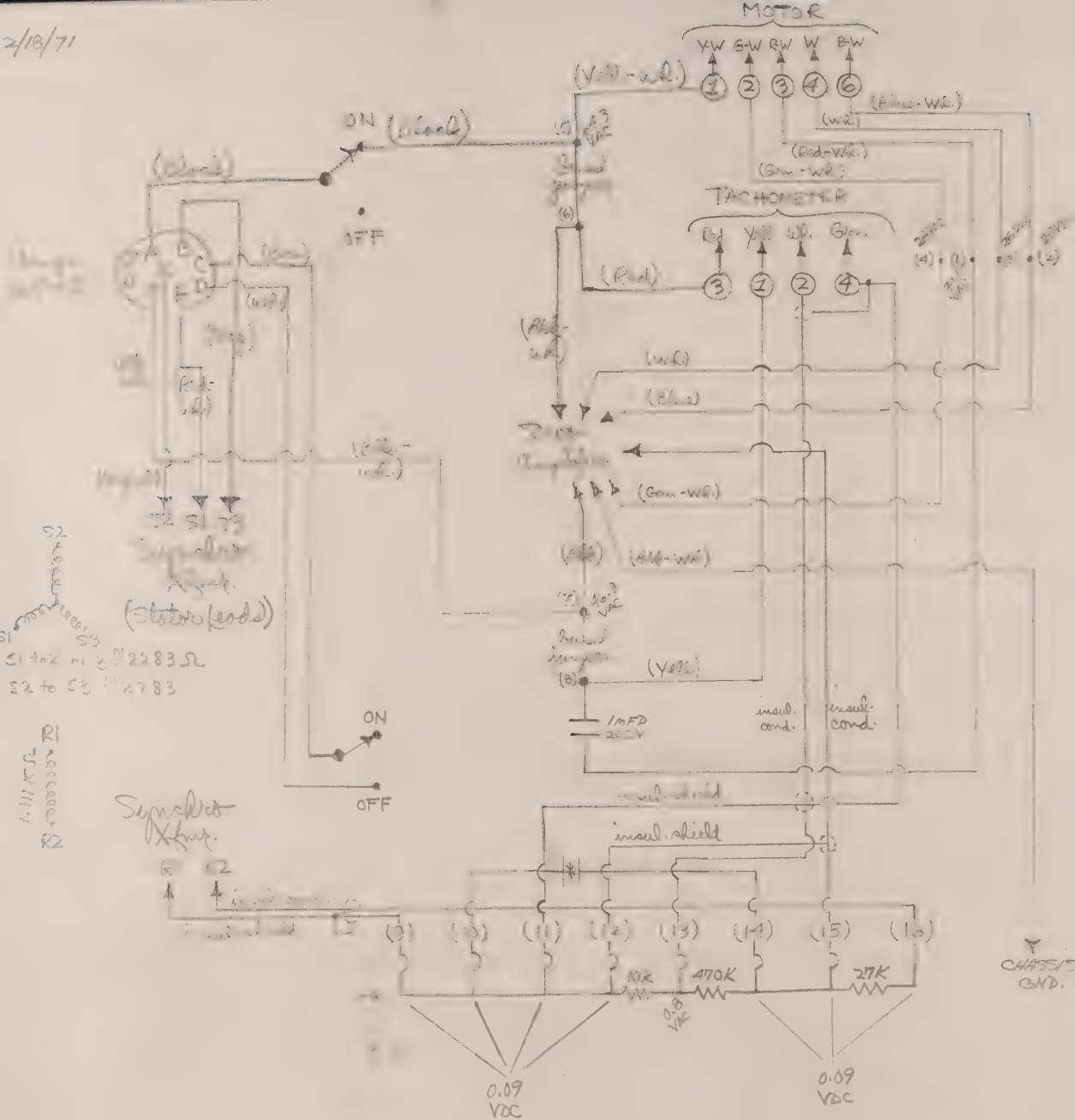
SPACER (2) 1/4 I.D. X 1/20 D X .070 TK.

PACKING PAD CD-10

SCREW 8-32UNC. 1/2 Lg. (10) SOCKET HD CAP SCREWS

SCREW 8-32-UNC 1/4 Lg. (8) OVAL HD SCREWS

2/18/71

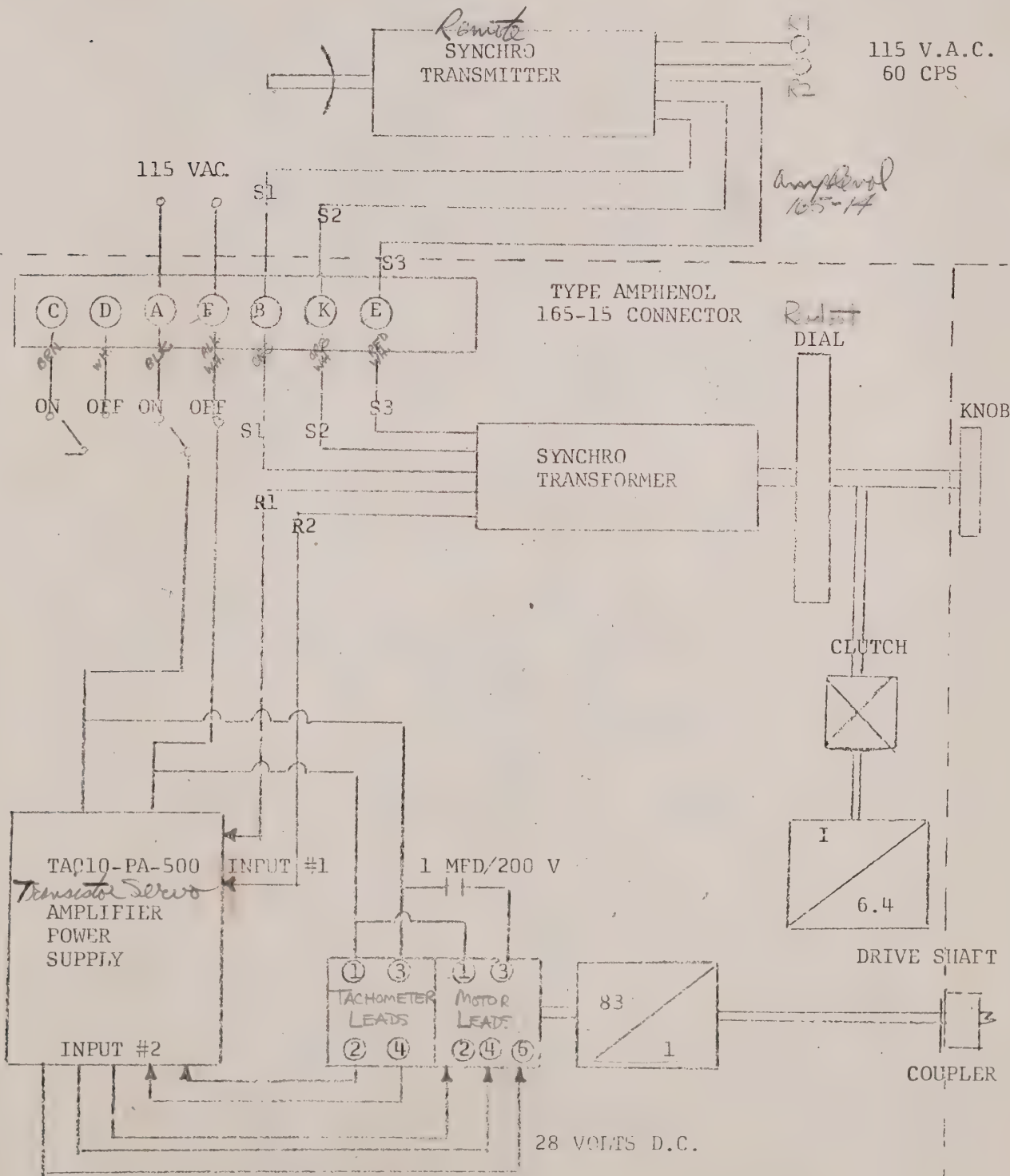


*HOPKINS
P120
.1-200V

(1) THRU (8) } SEPARATE
(9) " (16) } TERMINAL BD.
CONTACTS

RESISTORS $\frac{1}{4}W, \pm 10\%$

BLOCK DIAGRAM OF THE MODEL 130 SERVO DRIVE UNIT



Drive Servo Unit Inside Dotted Lines

By removing the four threaded retainers located at the back of the equipment it is possible to pull the instrument out (see Fig. 1).

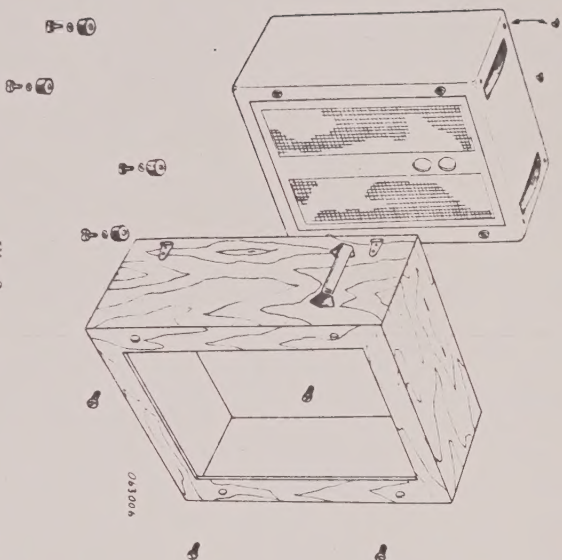


Fig. 2.

Type B.
Similar to Type A, but the instrument and the metal case are housed in a mahogany cabinet with cover. In this cabinet it is easy to transport the instrument.^{*)}

Type C.
Similar to Type A, but fitted with a frame suitable for mounting the instrument into a 19" standard rack. The method of assembling the frame and the instrument to a unit is shown in Fig. 3. After removing the four rubber feet the instrument and metal case can be placed into the mounting frame and secured by the four screws supplied with Type C.

^{*)} To house Type A instruments in mahogany cabinets, remove the four threaded retainers, located at the back of the metal case, and the four rubber feet. Place the instrument and the metal case into the mahogany cabinet, and then replace the threaded retainers, which are the rubber feet, (Fig. 2) which will now require the longer fixing screws, which are delivered with the mahogany cabinet.

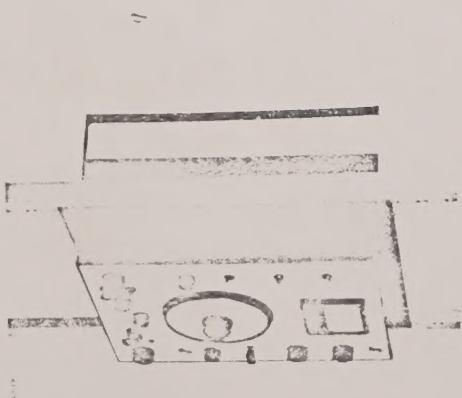
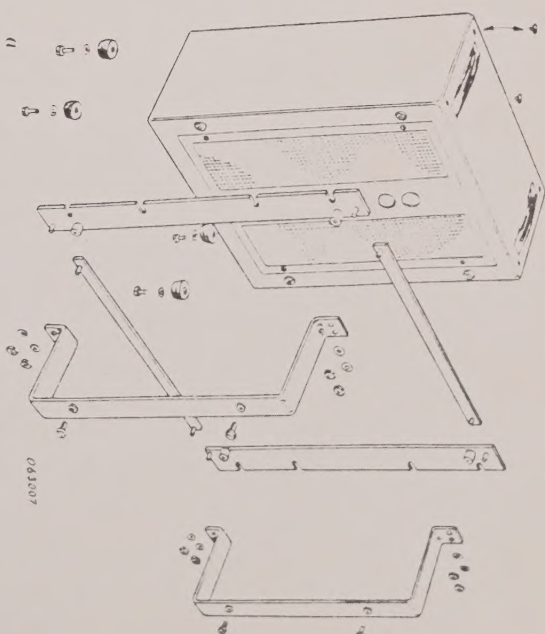


Fig. 3. a: Assembly of the frame. b: The instrument mounted in the frame into 19" standard rack.

